Models of Probability of Failure on Demand for Safety Instrumented System Using Atmospheric Elements

Rachid Ouache[a] , Muhammad Nomani Kabir[b]

[a] Faculty of Engineering Technology, University Malaysia Pahang, Gambang 26300, Malaysia

[b] Faculty of Computer Systems & Software Engineering, University Malaysia Pahang, Gambang 26300, Malaysia

ABSTRACT

Safety instrumented system (SIS) is an essential device to protect the industries from dangerous situations. Reliability of SIS is measured by the analysis of probability of failure on demand (PFD) which is an integral part in quantitative risk and safety assessment to determine the risk and safety integrity level. PFD varies from location to location due to atmospheric effects. In this paper, new mathematical models are proposed to compute the failure probability of the equipment due to corrosion considering three atmospheric factors: temperature, humidity and wind speed. The models are solved by least squares methods using standard data to identify the parameters involved in the models. Finally, comparison between the two proposed models is made to select the better model for computing the failure probability. The models provide good correlation with reference data. These models can be used to compute the PFD at any geographical location.

KEYWORDS: Safety instrumented system; Probability of failure on demand; Atmospheric elements; Reliability; Linear and nonlinear least squares

DOI: 10.1016/j.ssci.2016.03.015